

# U.S. crude oil production: Recent trends and outlook



*For*

*Workshop on Trends in Sources of Crude Oil*

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*By*

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## EIA mission: independent statistics and analysis

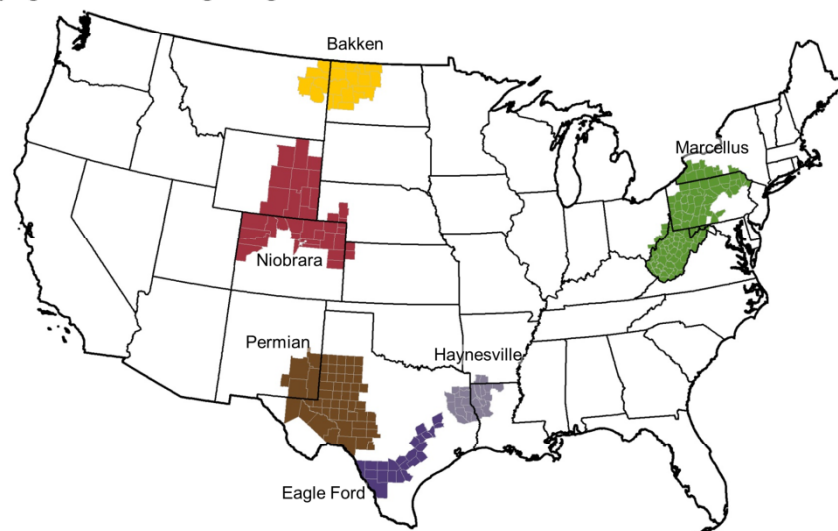
- EIA was created by the U.S. Congress in 1977
- EIA collects, analyzes, and disseminates independent and impartial energy information to promote sound policymaking, efficient markets, and public understanding of energy and its interaction with the economy and the environment
- EIA is the Nation's premier source of energy information and, by law, its data, analyses, and forecasts are independent of approval by any other officer or employee of the U.S. Government
- EIA does not propose or advocate any policy positions

## EIA produces data series, analyses, and energy projections

- *Weekly, monthly, and annual data*
  - Displays U.S. and regional production, stocks, blender inputs, imports, and exports
- *Real-time analyses*
  - Digests important developments in Today in Energy, **This Week in Petroleum**, Issues & Trends, Country Analysis Briefs
- *Short-Term Energy Outlook (STEO)*
  - Forecasts U.S. supplies, demands, imports, stocks, and prices of energy with a horizon of 12 to 24 months
- *Annual Energy Outlook (AEO)*
  - Presents 25- to 30-year projection and analysis of U.S. energy supply, demand, and prices
- *International Energy Outlook (IEO)*
  - Assesses international energy production and consumption

# Drilling Productivity Report

Key tight oil and shale gas regions

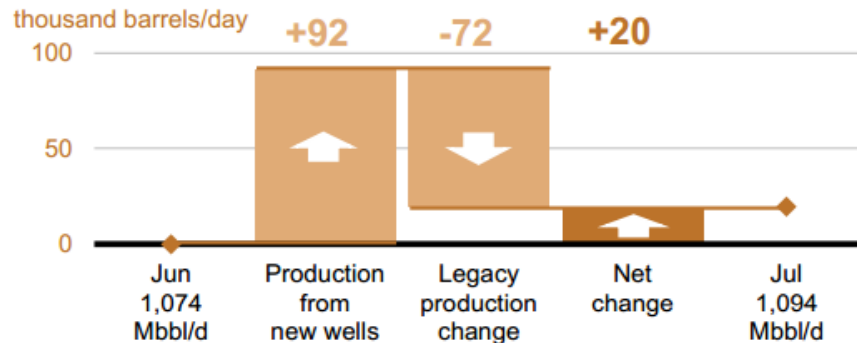


Source: <http://www.eia.gov/petroleum/drilling/>

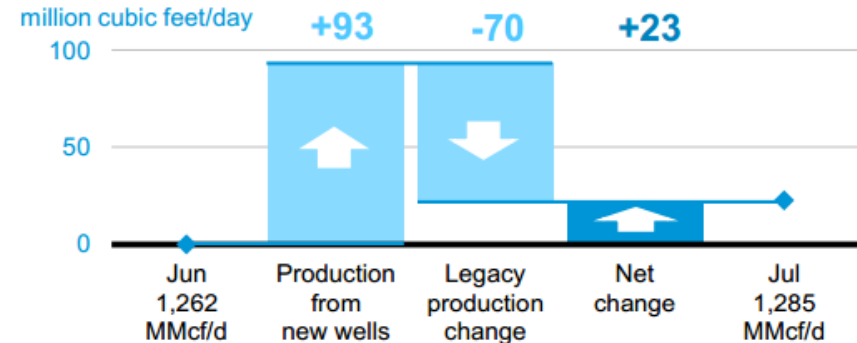
- Six shale plays account for nearly 90% of domestic oil production growth and virtually all domestic natural gas production growth over the last few years
- Higher drilling efficiency and new well productivity, rather than an increase in the rig count, have been the main drivers of recent production growth
- Steep legacy production decline rates are being offset by growing production from new wells
- The number of wells drilled nationwide that produce both oil and natural gas increased from 37% in 2007 to 56% in 2012

# Bakken oil production is over 1 million b/d

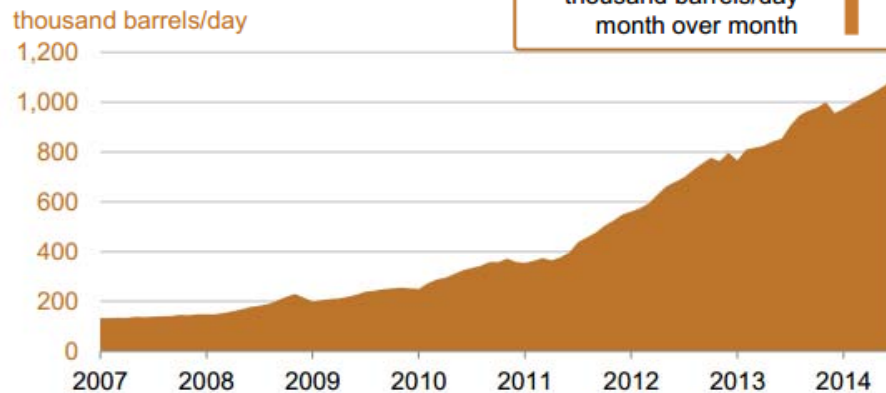
**Bakken**  
**Indicated change in oil production (Jul vs. Jun)**



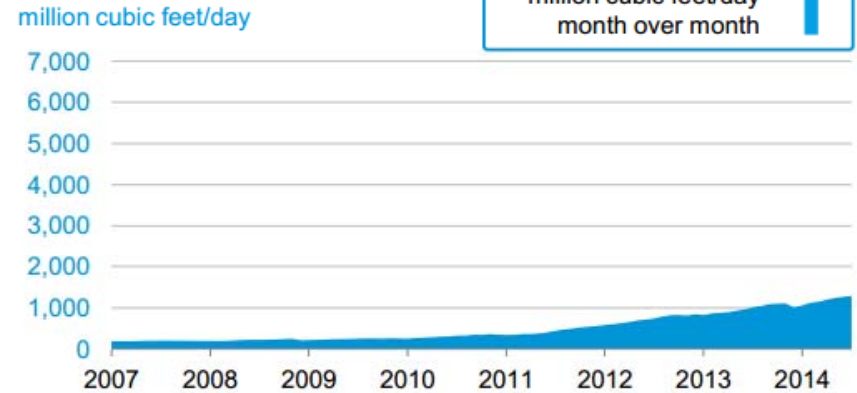
**Bakken**  
**Indicated change in natural gas production (Jul vs. Jun)**



**Bakken**  
**Oil production**



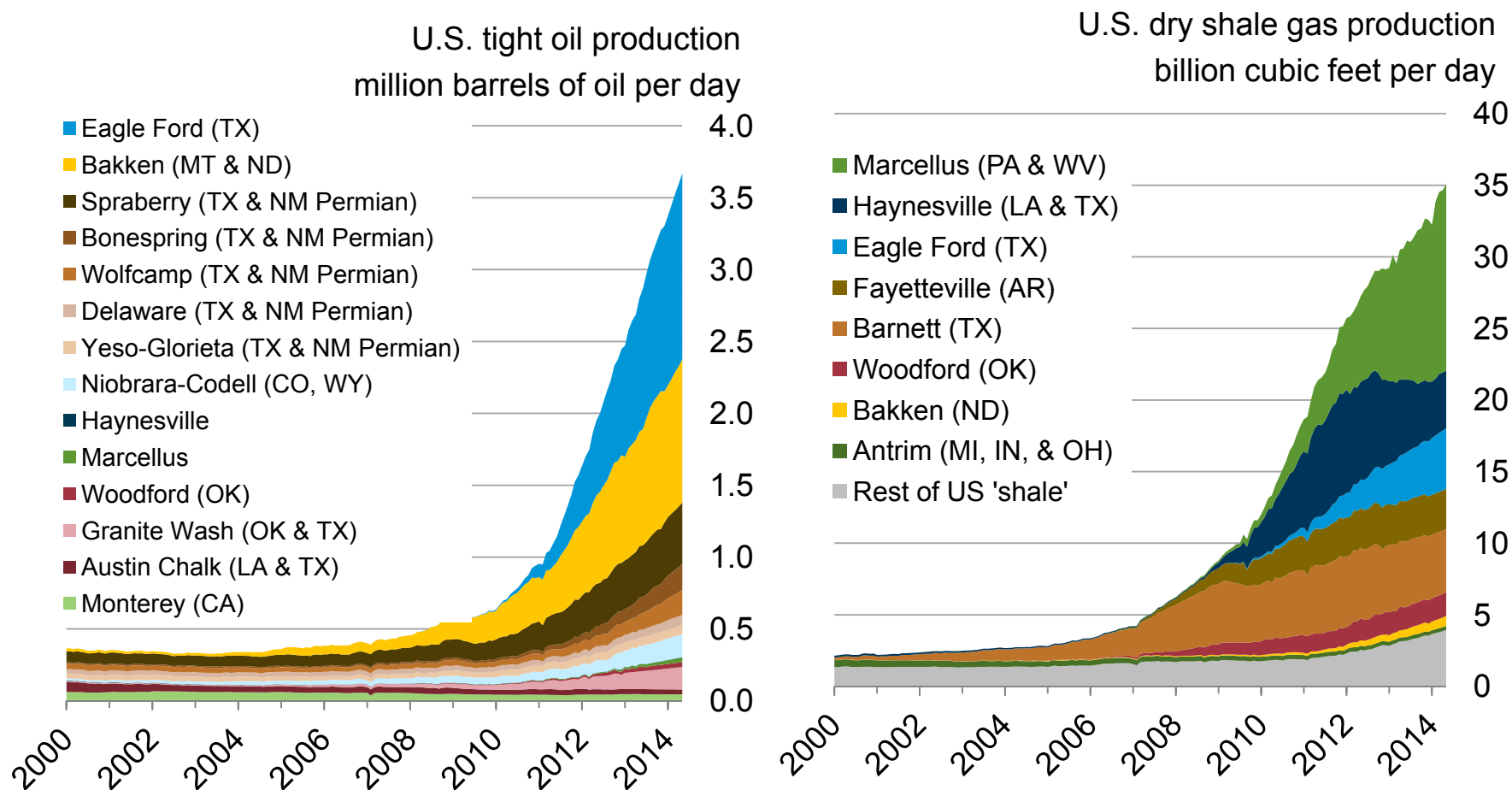
**Bakken**  
**Natural gas production**



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# The U.S. has experienced a rapid increase in natural gas and oil production from shale and other tight resources



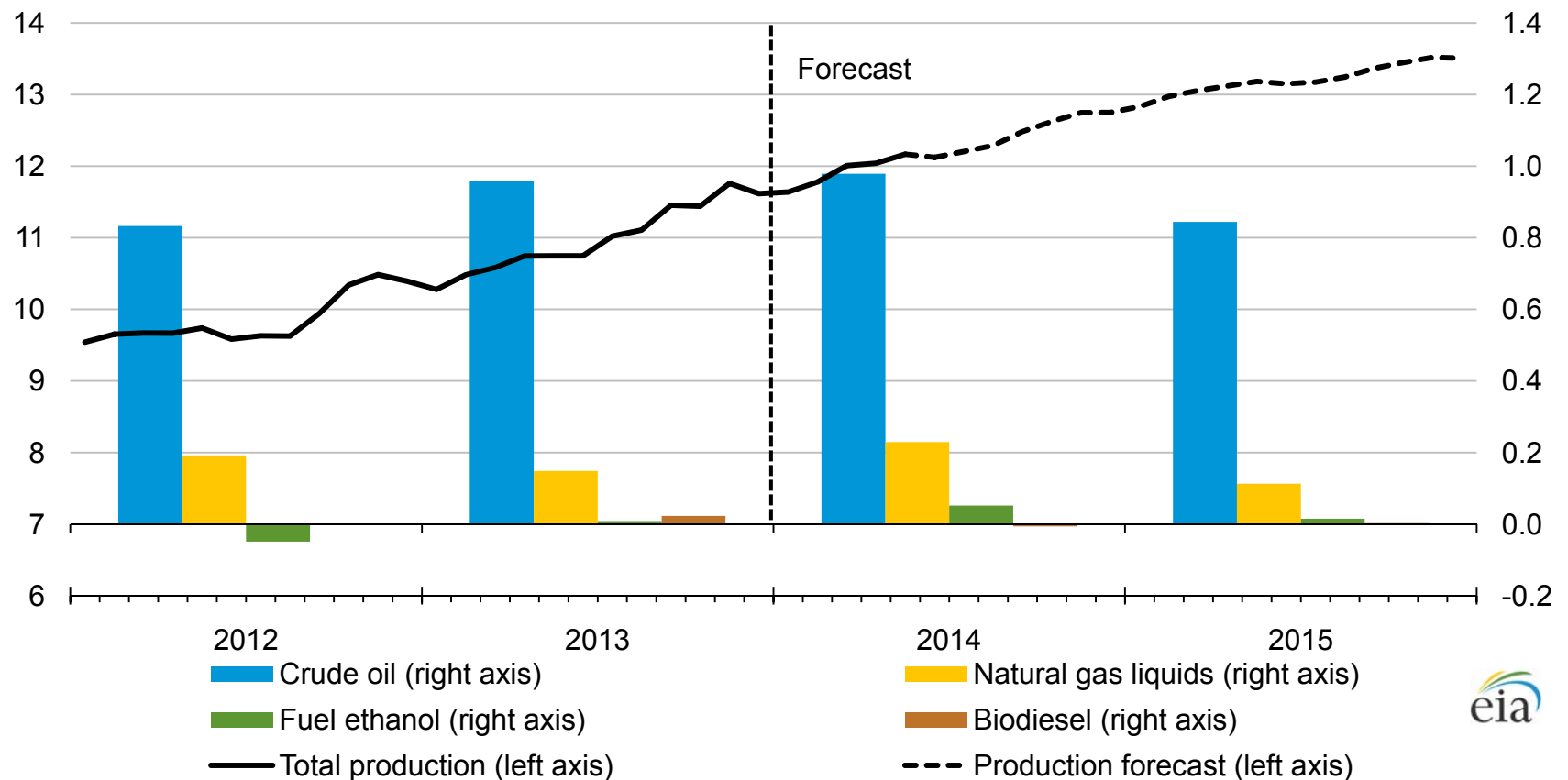
Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through May 2014 and represent EIA's official tight oil & shale gas estimates, but are not survey data. State abbreviations indicate primary state(s).

U.S. crude oil production in 2013 grew by nearly 1 million b/d and expected to grow by a similar amount in 2014

## U.S. Crude Oil and Liquid Fuels Production

million barrels per day (MMbbl/d)

annual change (MMbbl/d)



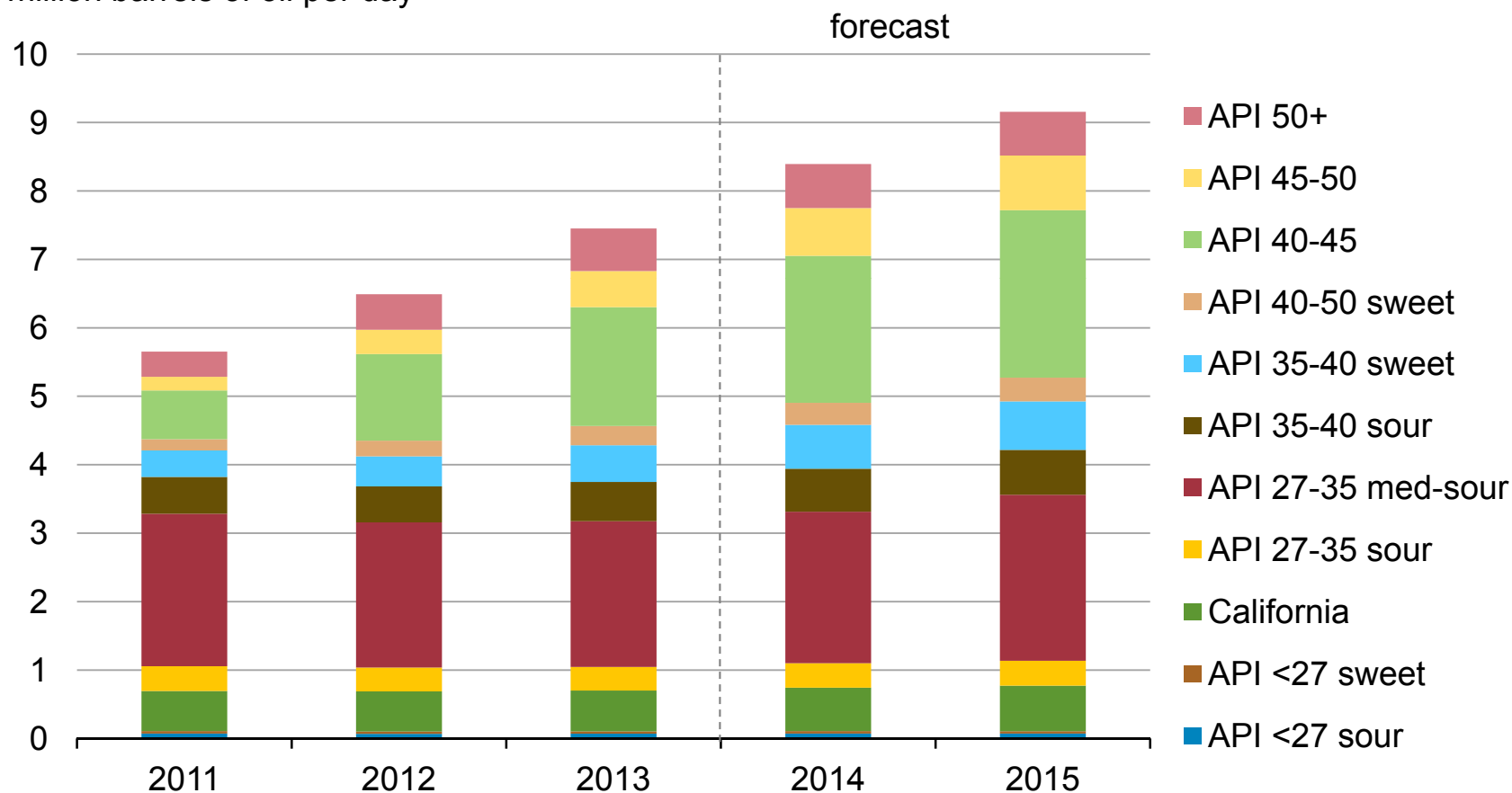
Source: U.S. Energy Information Administration, Short-Term Energy Outlook June 2014

## Key insights on U.S. crude production trends

- Recent U.S. crude oil production growth has consisted primarily of lighter, sweet crude from tight resource formations
  - 96% of the 1.8 million b/d growth in production between 2011 and 2013 consisted of sweet grades with API gravity of 40+
- EIA analysis of current and forecast crude oil production indicates that U.S. supply of lighter API gravity crude will continue to outpace that of medium and heavier crudes
  - More than 60% of EIA's forecast of production growth for 2014 and 2015 consists of sweet grades with API gravity of 40+
  - 28% of production growth in 2015 is Gulf of Mexico API gravity 27-35 medium sour oil
- The availability, quality and timeliness of well-level API gravity data vary widely across states
- Of the 1.5 million b/d decline in crude oil imports over 2011-2013, nearly 50% was API gravity 35+

## Roughly 96% of the growth in production between 2011 and 2013 consisted of sweet grades with API gravity of 40 or above

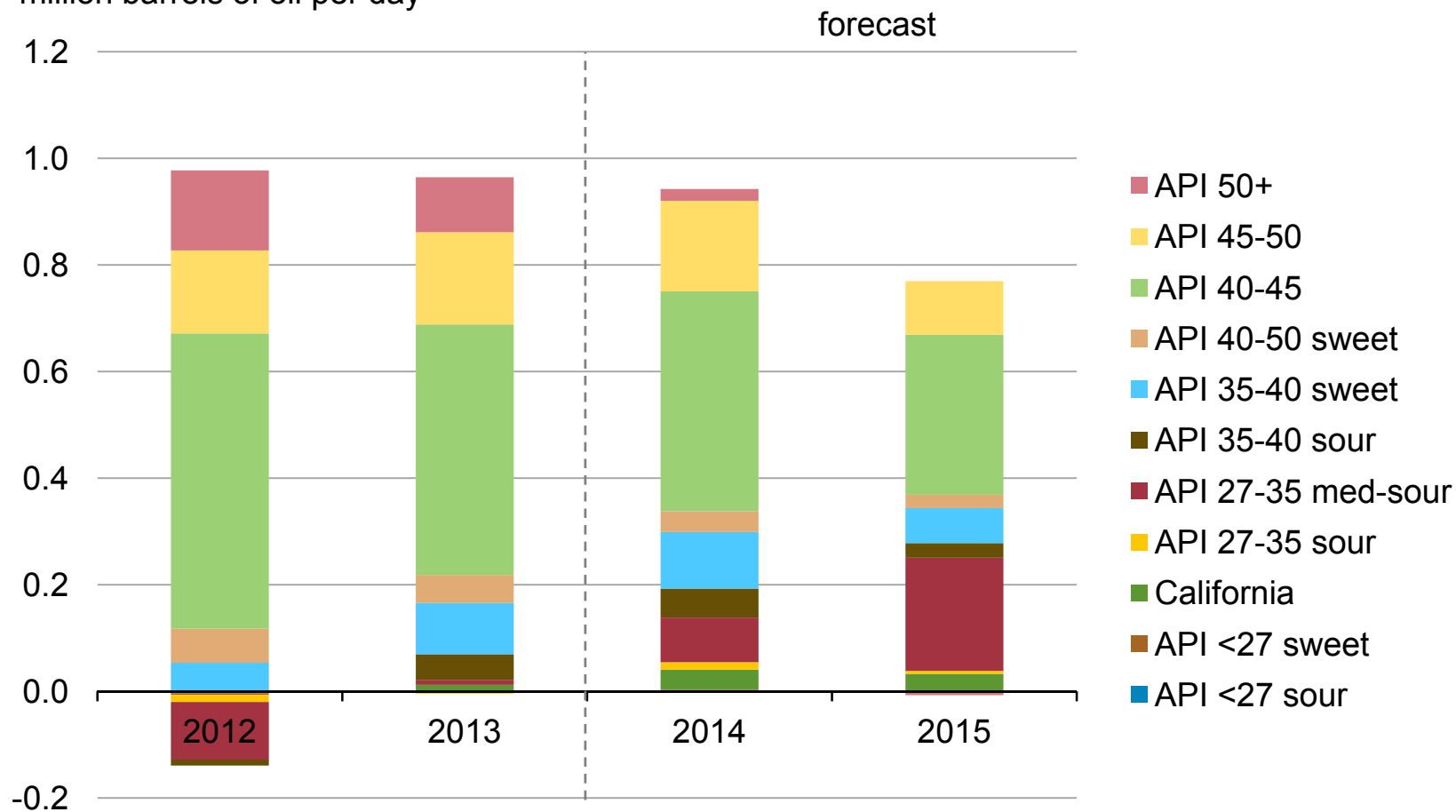
U.S. crude oil production by type  
million barrels of oil per day



Source: EIA, DrillingInfo, Colorado DNR, Texas RRC. <http://www.eia.gov/analysis/petroleum/crudetypes/>

## More than 60% of EIA's production growth forecast for 2014 and 2015 consists of sweet grades with API gravity of 40+

Annual change in U.S. crude oil production by type  
million barrels of oil per day



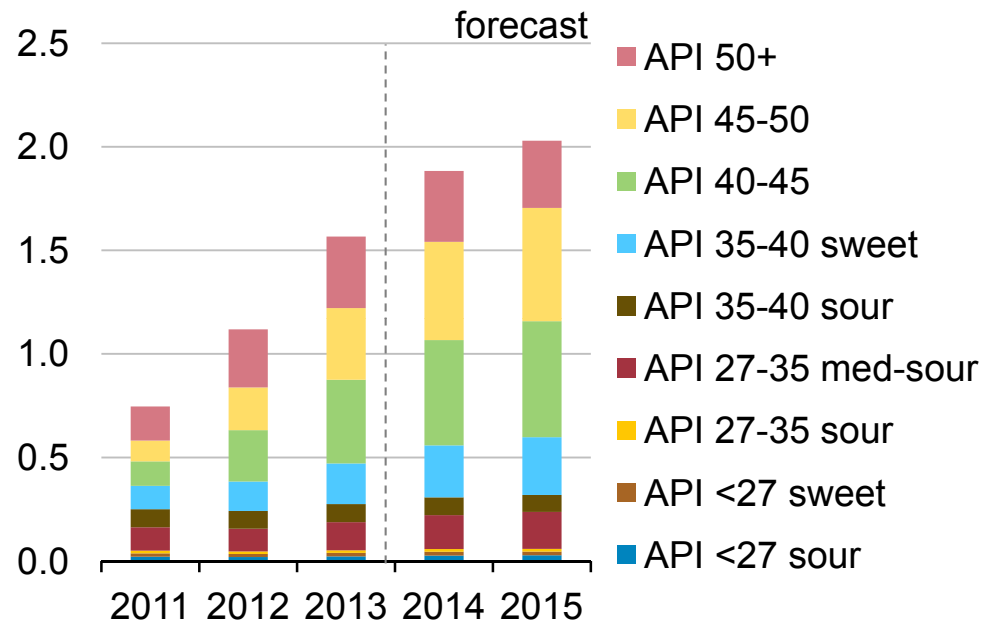
Source: EIA, DrillingInfo, Colorado DNR, Texas RRC.

## API 40-50 oil production growth is driven largely by markets

- Limited downstream demand for API 50+ feedstocks causes buyers to discount its price
- Producers are incentivized to drill for lower API gravity oil -- but are limited by what can be readily produced
- Best drilling returns for <50 API gravity oil in onshore lower-48 states come from liquids-rich regions of shale/tight formations bearing 40-50 API gravity oil

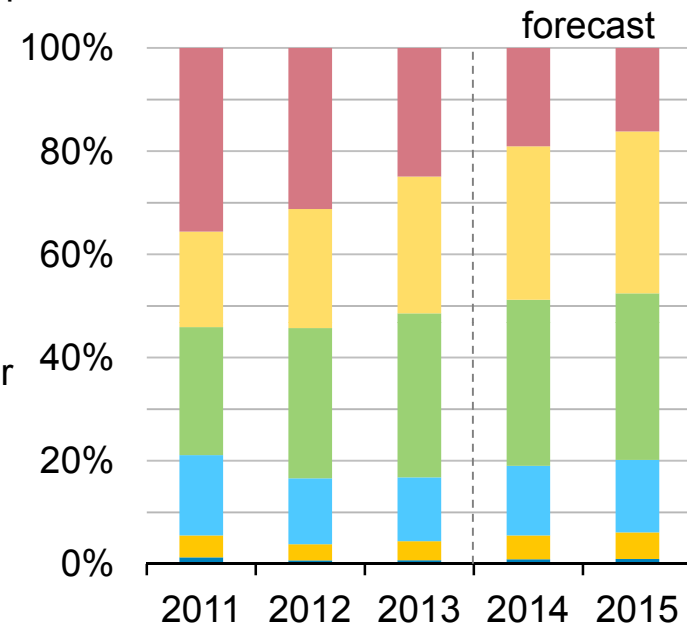
# Eagle Ford is driving growth of Gulf Coast API 40-50 production

Gulf Coast crude oil production by crude type  
million barrels of oil per day



Source: EIA, DrillingInfo, Texas RRC.

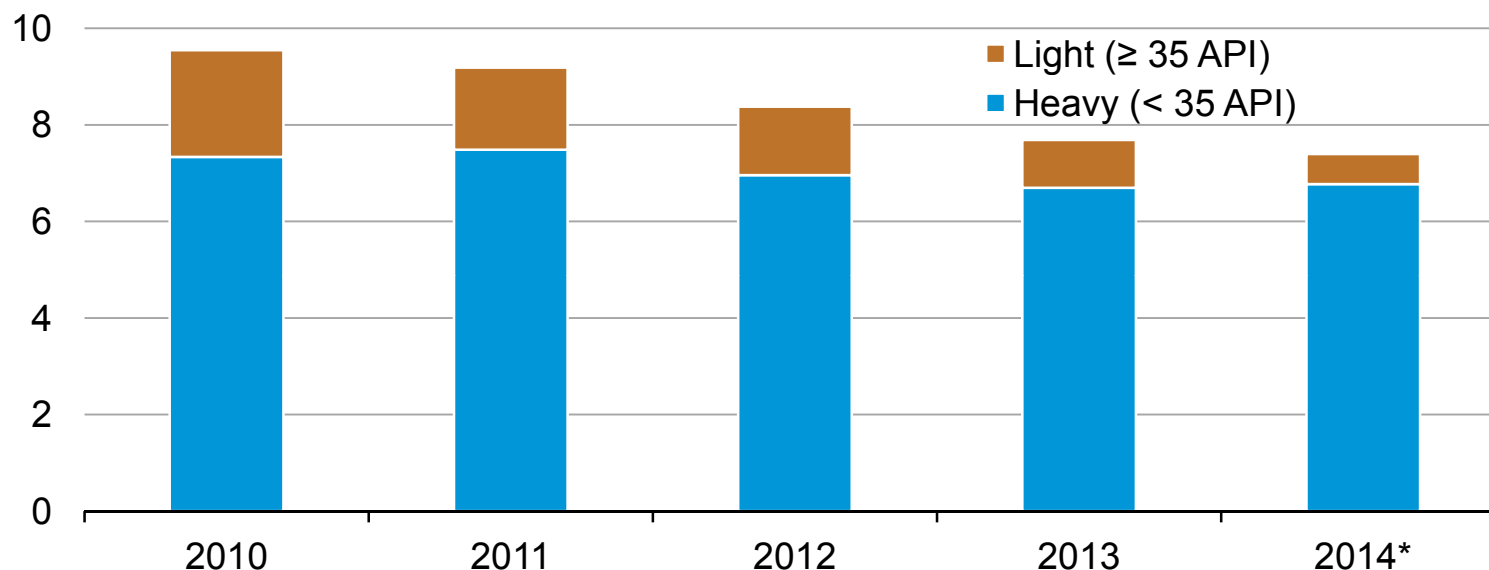
Annual distribution of Eagle Ford production  
percent



- The Eagle Ford formation becomes deeper moving from northwest to southeast, creating an oil window, a wet gas window, and a dry gas window
- Since 2010, producers in the Eagle Ford have moved steadily towards areas with more liquids, as prices have continued to favor oil over natural gas

## Imports of light crude (API gravity 35+) fell from 1.7 million b/d in 2011 to 0.6 million b/d during first two months of 2014

U.S. crude oil imports  
million barrels of oil per day



*Note: 2014 data is January and February only.*

*Source: U.S. Energy Information Administration, Petroleum Supply Monthly.*

- Of the total 1.5 million b/d decline in crude oil imports between 2011 and 2013, nearly 50% was light crude (API gravity 35+)
- API 40+ imports fell from 0.6 million b/d in 2011 to 0.2 million b/d in 2013, and averaged only 0.1 million b/d during the first two months of 2014

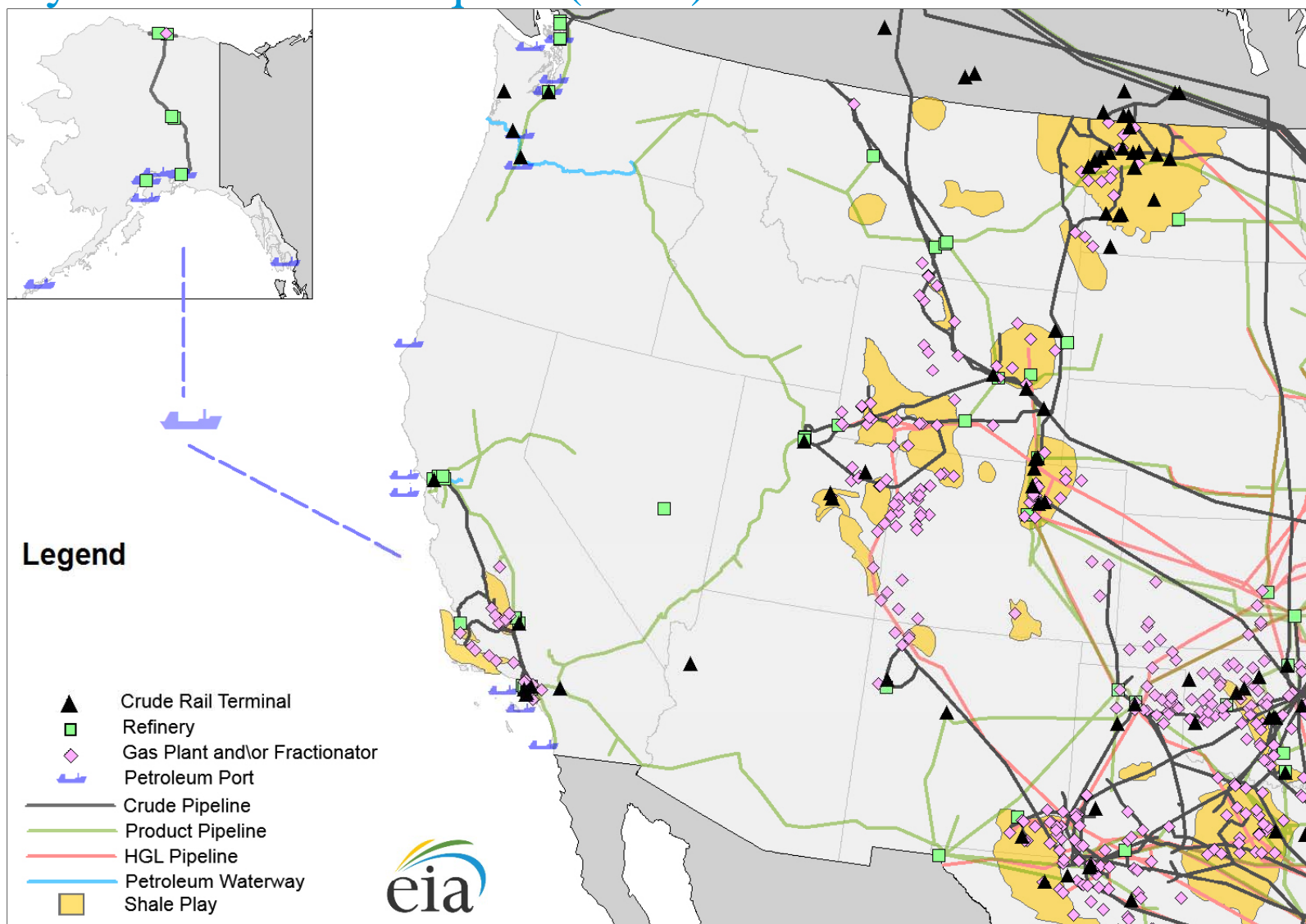
## Consequences of increased domestic oil production

- Additional production of light oil over the past several years has for the most part been absorbed by reducing imports of similar grades oils
- Other responses include:
  - Increased crude oil exports (244,000 b/d in first quarter 2014)
  - Increased average API gravity of crude inputs to domestic refining
  - Increased refinery runs
- Future options include:
  - Continued shifts in the refinery input mix
  - Added splitters to convert light crude into a mix of heavier fractions to feed domestic refineries and light products valued in other markets
  - Continued increases in crude oil exports

## How EIA's crude quality characterization fits into its data collection programs

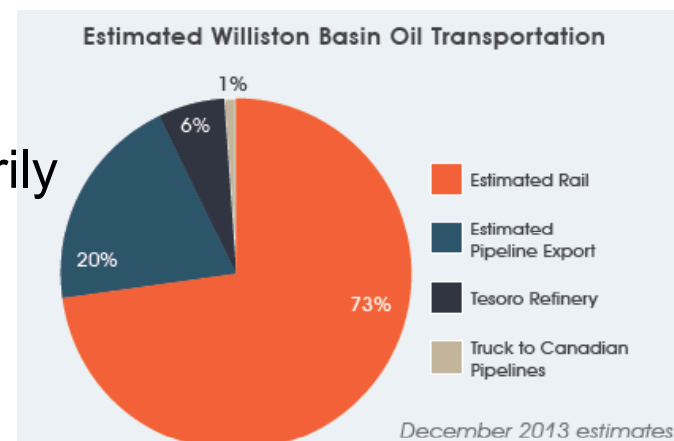
- EIA is now seeking public comment on a plan to expand its EIA-914 survey to include both oil and natural gas production in 20 states and the Gulf of Mexico
- The proposed data collection is to be launched in 2015 and will provide information on production by crude type (API gravity and sulfur content)
- EIA purchases data from the private sector to augment survey data with well-level information such as well logs and data cleaning
- EIA is collaborating with the Ground Water Protection Council (GWPC) to collect and disseminate well-level data

## Rail is the primary, if not only, way to move inland crude oil and Hydrocarbon Gas Liquids (HGL) to the West Coast



## North American crude-by-rail (CBR) developments

- Price differentials make rail attractive
- Market response: significant capital investment to capitalize on spreads
  - New unit training loading facilities in key shale plays (Bakken/Williston, Niobrara, Uinta, Alberta)
  - New multi-modal logistics hubs at destination markets (Cushing, OK; St. James, LA; Pt. Arthur, TX; Albany, NY; Bakersfield, CA)
  - New unit train unloading capability at coastal refineries (Philadelphia, PA; St. John, NB; Anacortes/Ferndale, WA)
- Pipeline capacity underutilized
  - Rail captures 73% Bakken takeaway in 2013
  - Rail primarily to coastal unloading facilities
  - Pipeline delivers primarily to U.S Gulf
- North American CBR development primarily to bring Bakken and Alberta crude oil to market

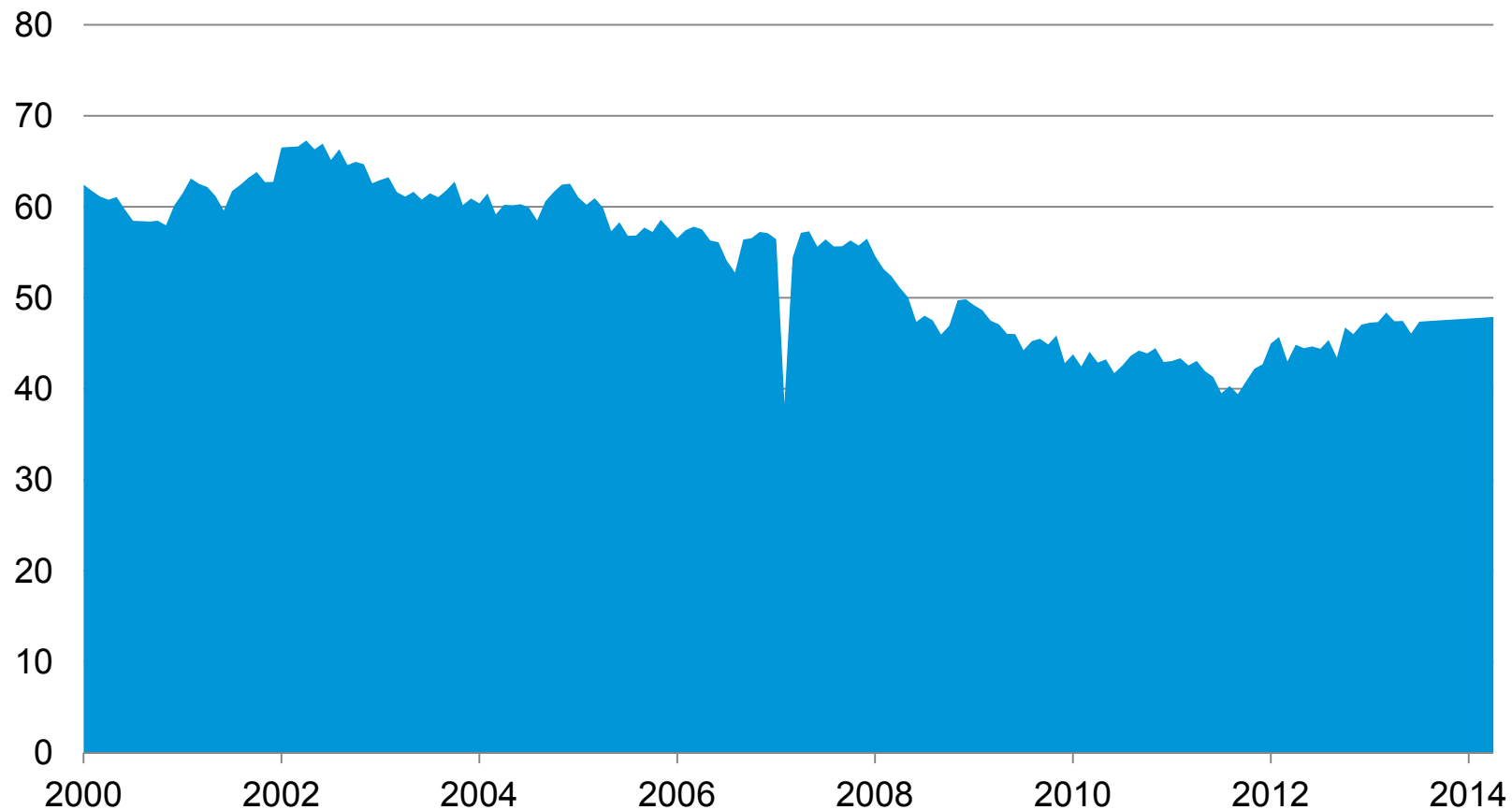


Sources: PLG Consulting, March 2014; North Dakota Pipeline Authority, The Pipeline Publication, Feb. 2014.

## Monterey oil production includes comingled conventional oil

tight oil production

thousand barrels of oil per day



Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through April 2014 and represent EIA's official tight oil estimates, but are not survey data.

## Oil production from the Monterey play is not a material part of the U.S. oil production outlook in either *AEO2013* or *AEO2014*

- EIA estimates U.S. total crude oil production averaged 8.3 million barrels/day in April 2014
- Economically recoverable oil from the Monterey
  - AEO2014 Reference case averaged 57,000 barrels/day over 2010-2040
  - AEO2013 Reference case averaged 14,000 barrels/day over 2010-2040
- The difference in production between the AEO2013 and AEO2014 is a result of data updates for currently producing wells which were not previously linked to the Monterey play and include both conventionally-reservoired and continuous-type shale areas of the play

## For more information

U.S. Energy Information Administration home page | [www.eia.gov](http://www.eia.gov)

Annual Energy Outlook | [www.eia.gov/aeo](http://www.eia.gov/aeo)

Short-Term Energy Outlook | [www.eia.gov/steo](http://www.eia.gov/steo)

International Energy Outlook | [www.eia.gov/ieo](http://www.eia.gov/ieo)

Monthly Energy Review | [www.eia.gov/mer](http://www.eia.gov/mer)

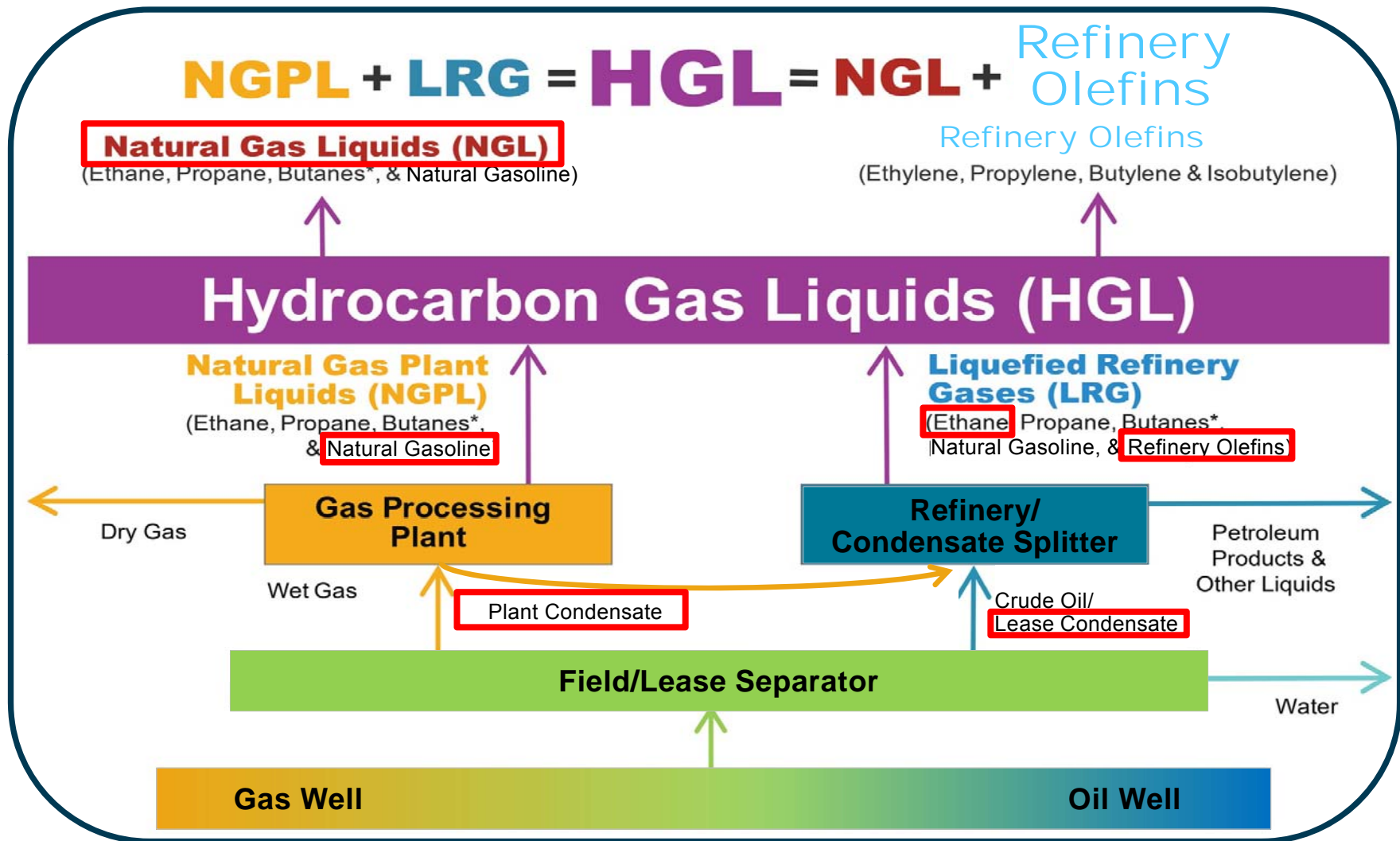
Today in Energy | [www.eia.gov/todayinenergy](http://www.eia.gov/todayinenergy)

State Energy Profiles | <http://www.eia.gov/state>

Drilling Productivity Report | <http://www.eia.gov/petroleum/drilling/>

# Supplemental Slides

# What are Hydrocarbon Gas Liquids? (HGL)



\*Butanes include normal butane and isobutane.

# Hydrocarbon gas liquids (HGL) realignment

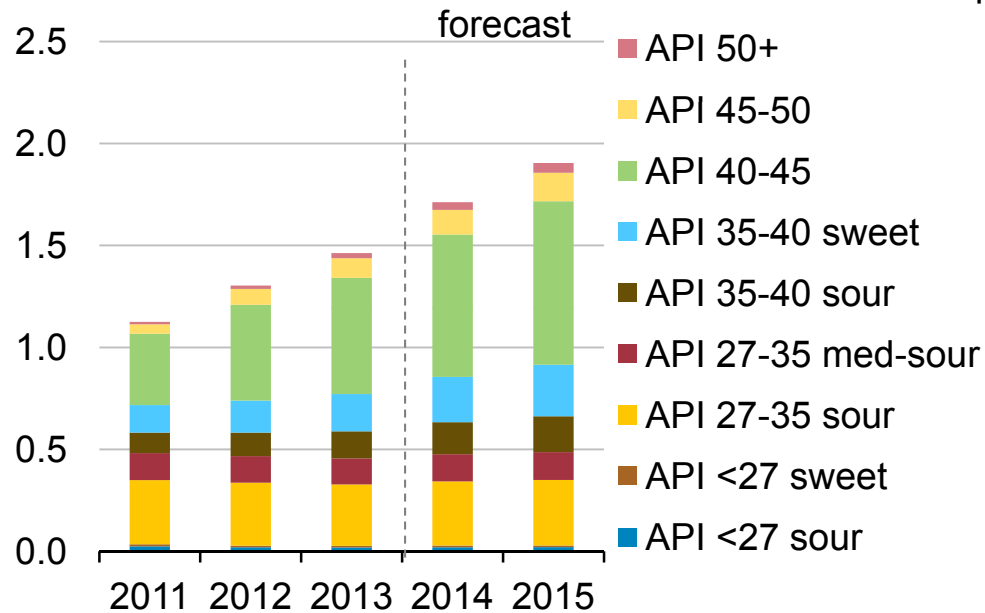
- EIA reviewed the **approaches and terminology** used by EIA and others to categorize and organize natural gas liquids (NGL) data.
- Uncovered definitional **inconsistencies** in the use of terms such as NGL, natural gas plant liquids (NGPL), and liquefied petroleum gases (LPG).
- Inconsistencies are **adversely affecting** the quality and clarity of U.S. and international energy information.
- Following outreach to the effected industries, EIA is now implementing a hydrocarbon gas liquids **realignment and clarification of terminology**.

# Summary of EIA's most significant planned changes for HGL

- Segregate refinery **olefins** (ethylene, propylene, butylene, and isobutylene) from their saturated (alkane) counterparts
- Consistently treat **lease condensate** as crude oil and **plant condensate** as NGL
- Bring EIA's Liquefied Petroleum Gas (LPG) definition into conformity with the industry by **removing ethane and refinery olefins** from definition
- Create new term **Hydrocarbon Gas Liquids (HGL)** as a way to reconcile the supply side and the demand side data

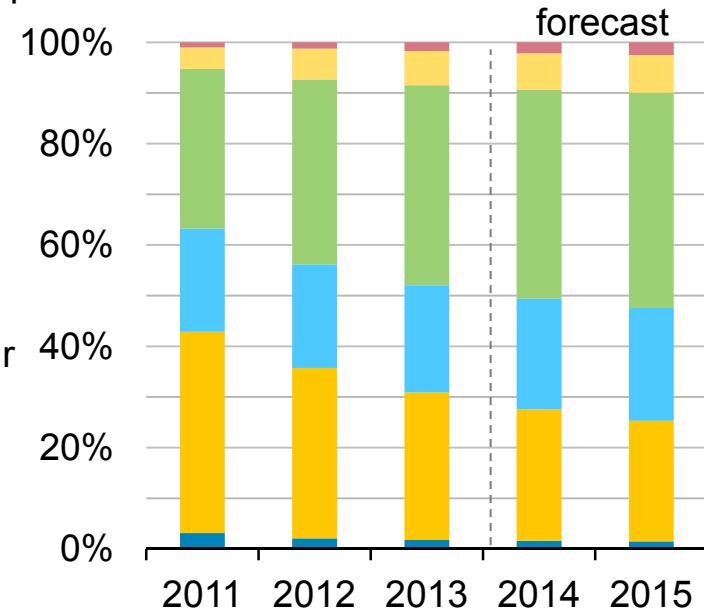
## Permian Basin API 40-45 crude is the fastest growing component of Southwest region production

Southwest crude oil production by crude type  
million barrels of oil per day



Source: EIA, DrillingInfo, Texas RRC.

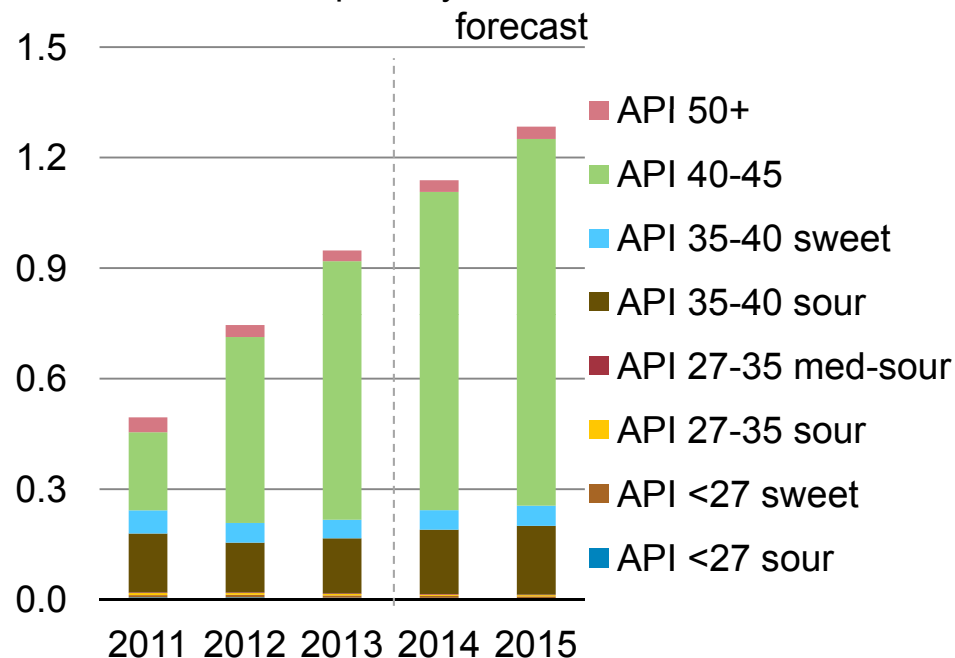
Annual distribution of Permian production  
percent



- Permian oil production is forecast to reach an annual average of 1.8 million b/d in 2015
- EIA analysis shows production by crude type changing rapidly, as new drilling in the basin increasingly targets the various stacked tight oil formations, rather than the conventional oil formations that have been developed for decades

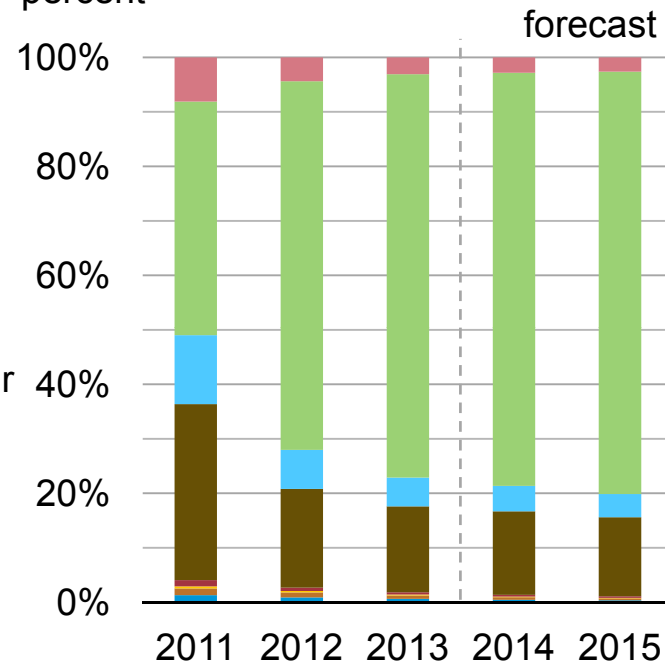
## Bakken crude dominates the Northern Great Plains crude quality

Crude oil production by well start date  
million barrels of oil per day



Source: EIA, DrillingInfo

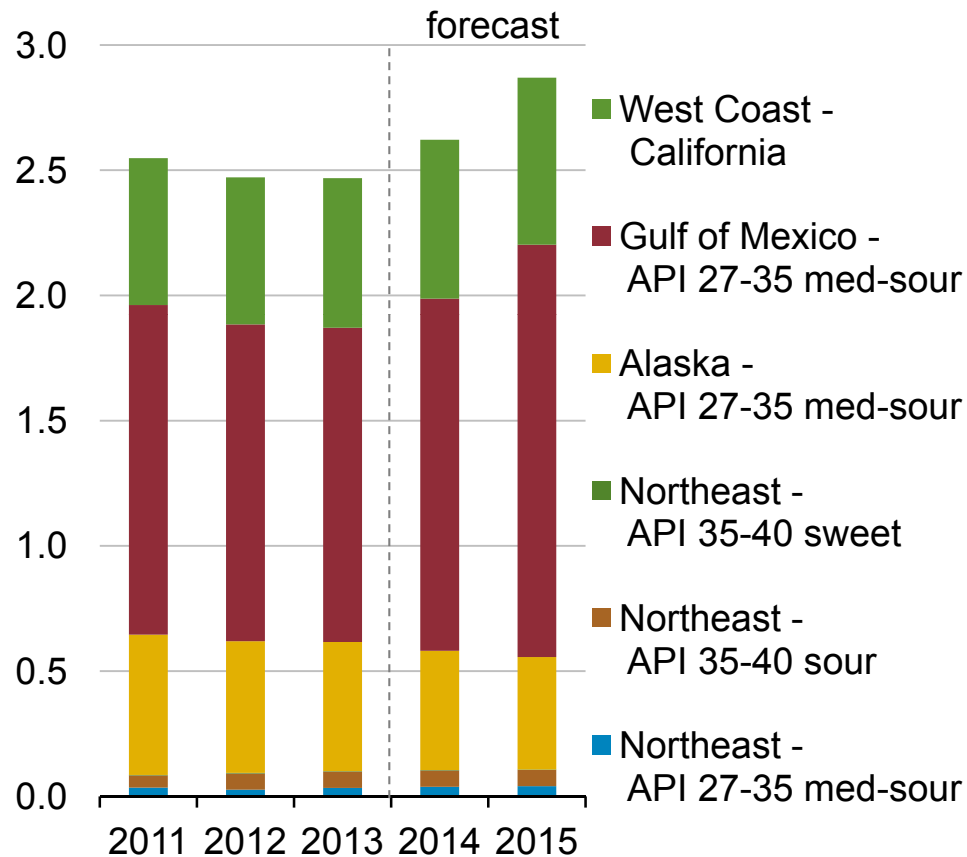
Annual distribution of N. Great Plains production  
percent



- Although additional API gravity data were not available for the Bakken, industry reports indicate that most Bakken wells produce relatively uniform quality crude oil between 38 and 44 degrees API gravity, and narrowly centered on 41 degrees API gravity

## Alaska, Gulf of Mexico, Northeast, and West Coast – growth in offshore production provides an increase in lower gravity crude

Alaska, Gulf of Mexico, Northeast, West Coast crude oil production forecast  
million barrels of oil per day

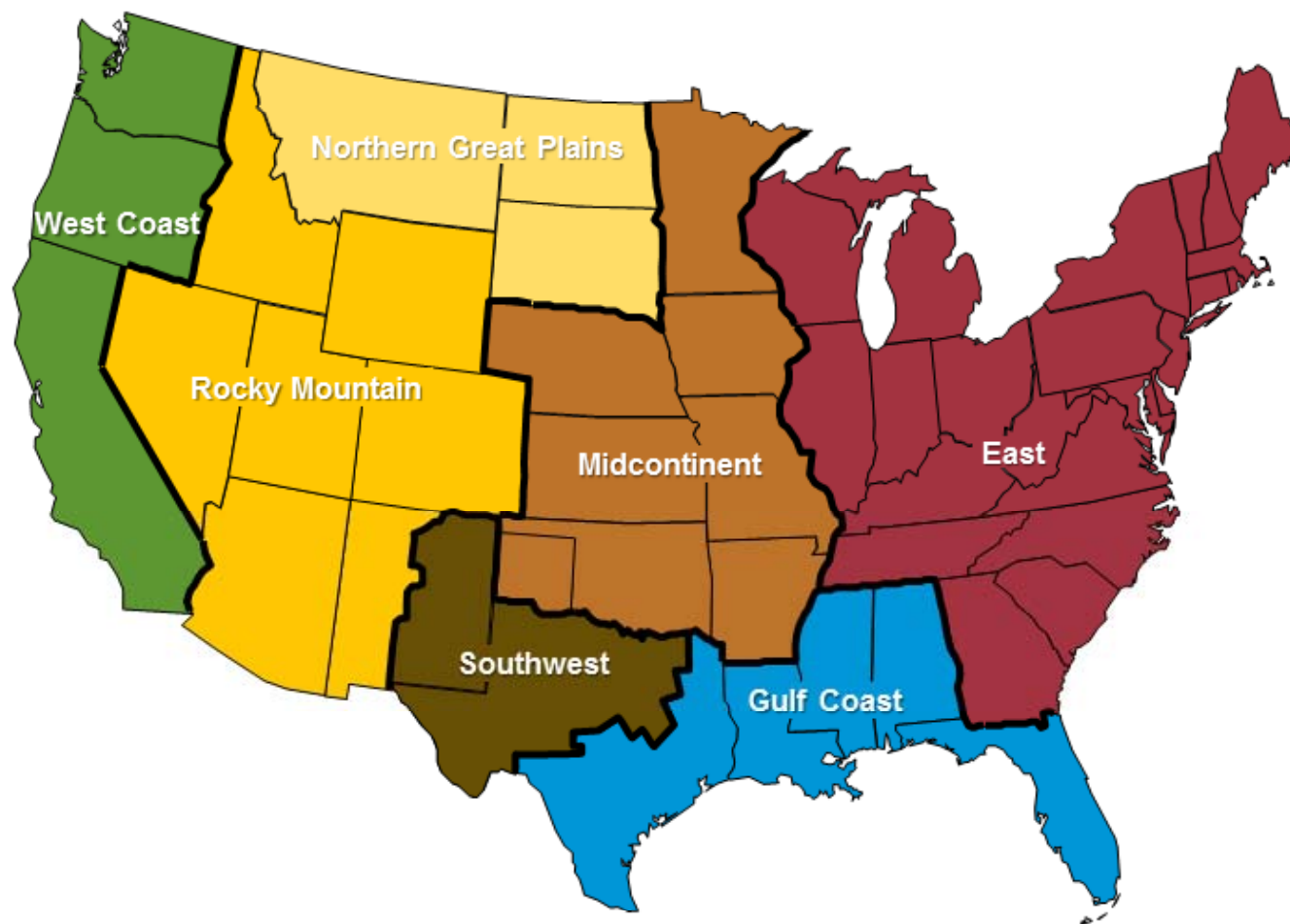


Source: EIA, DrillingInfo

- Crude oil produced in California, primarily API<27 sour, is categorized separately because it is generally produced and refined in the same geographic region, and it is somewhat isolated from the heavy crude market dynamics of the rest of the country
- Alaska production declines from 515,000 b/d to 450,000 b/d
- Gulf of Mexico production increases from 1.3 million b/d to 1.6 million b/d
- Northeast production increases slightly from 100,000 b/d to 110,000 b/d
- West Coast production increases from 600,000 b/d to 670,000 b/d

## EIA analyzes U.S. crude oil production according to the following regions

U.S. onshore lower-48 production regions



Source: EIA, Short-Term Energy Outlook

**Lower 48 expand sample coverage gas 92%**

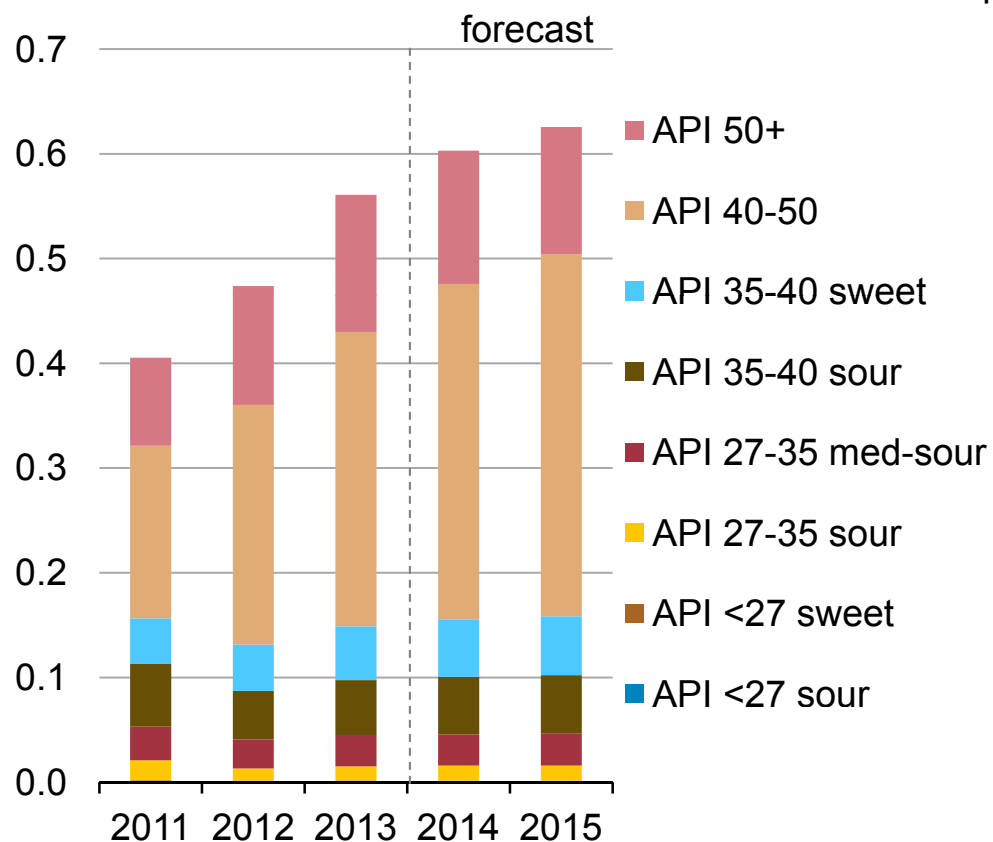
**Legend:**

- Current States/Areas
- Expansion States
- Other Producing States/Areas (only if producer operates in current or expansion state)
- Data Received From State Authorities
- Non-producing States

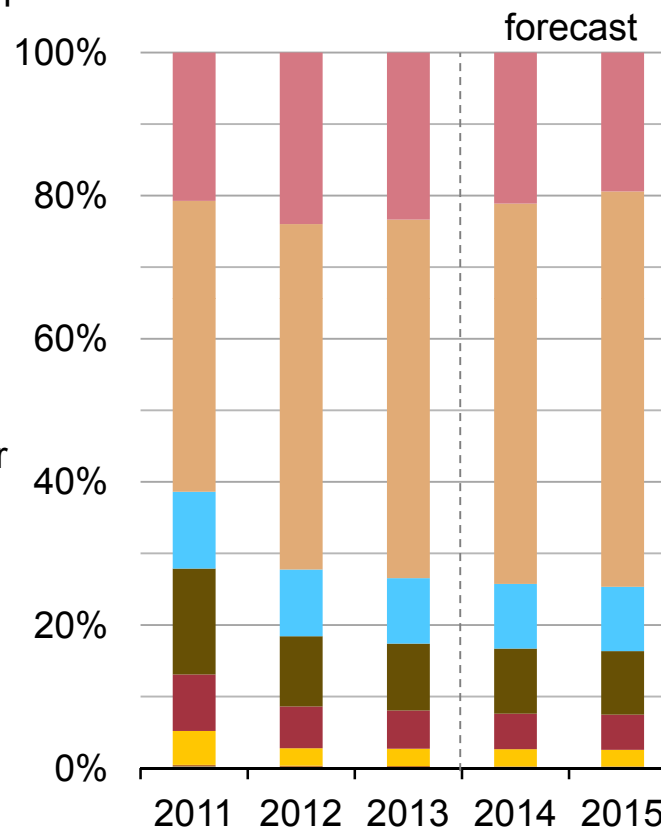
 Current States/Areas  
 Expansion States  
 Other Producing States/Areas (only if producer operates in current or expansion state)  
 Data Received From State Authorities  
 Non-producing States

## Midcontinent – recent and forecast production by crude type

Midcontinent crude oil production by crude type  
million barrels of oil per day



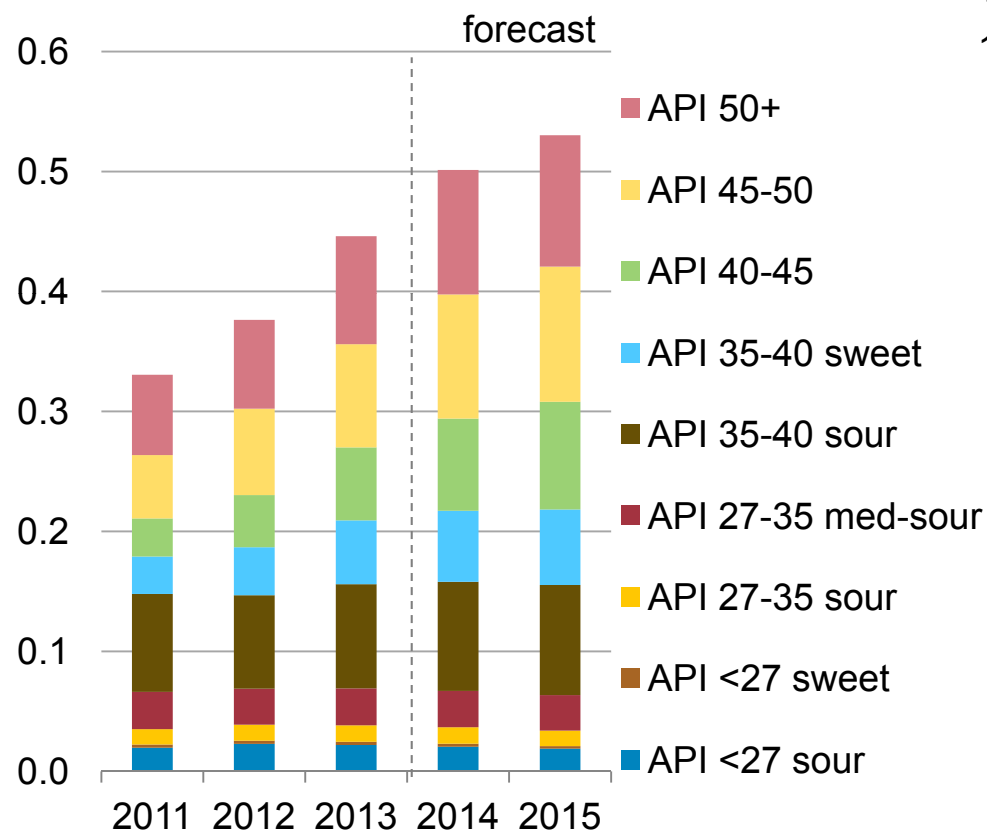
Annual distribution of Midcontinent production  
percent



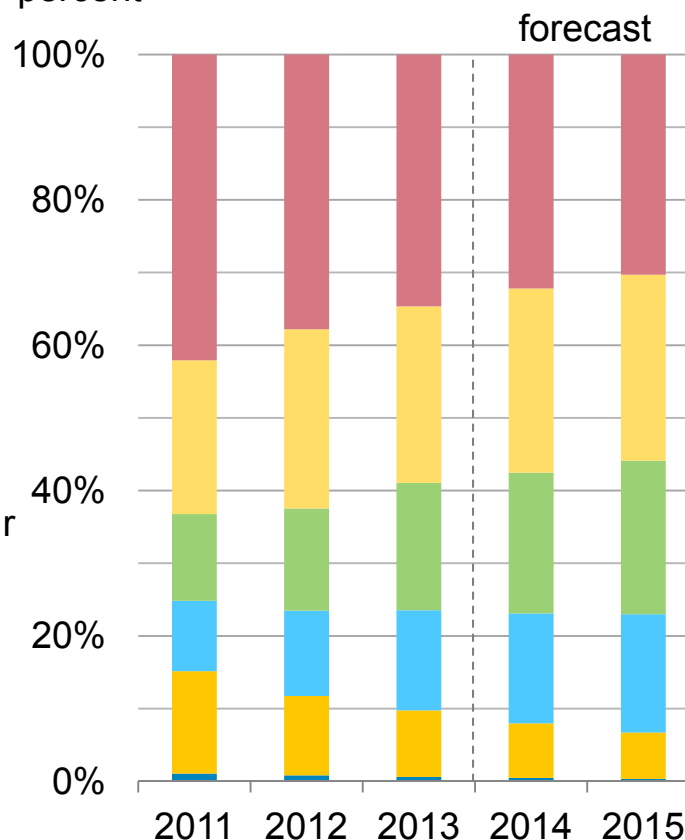
Source: EIA, DrillingInfo

## Rocky Mountain – A higher percentage of API 40+ crude is being produced, with a declining share in API 50+ crude

Rockies crude oil production by crude type  
million barrels of oil per day



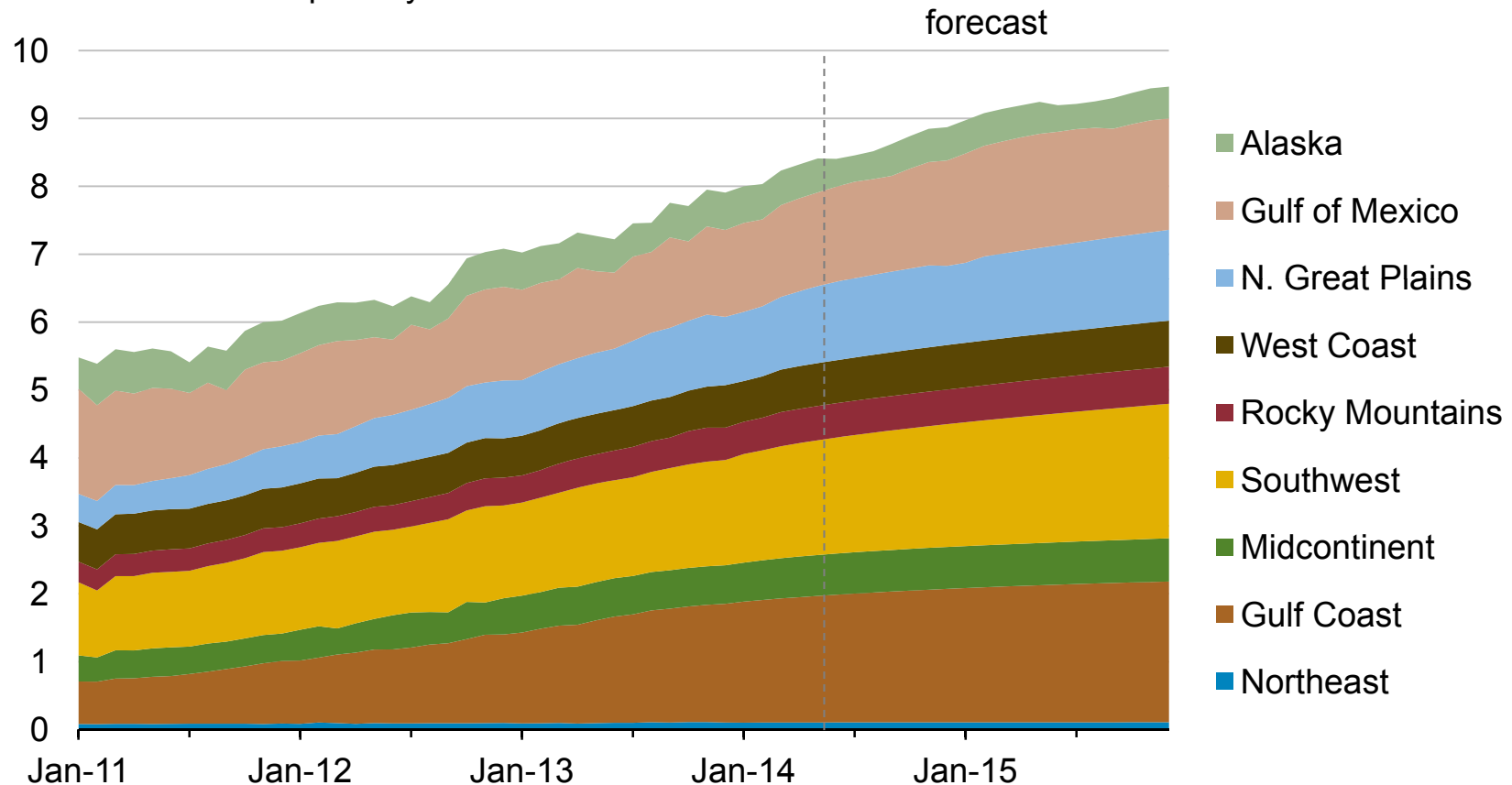
Annual distribution of Rockies production  
percent



Source: EIA, DrillingInfo

## EIA forecast that U.S. crude oil production will grow from an average of 7.4 million b/d in 2013 to 9.2 million b/d in 2015

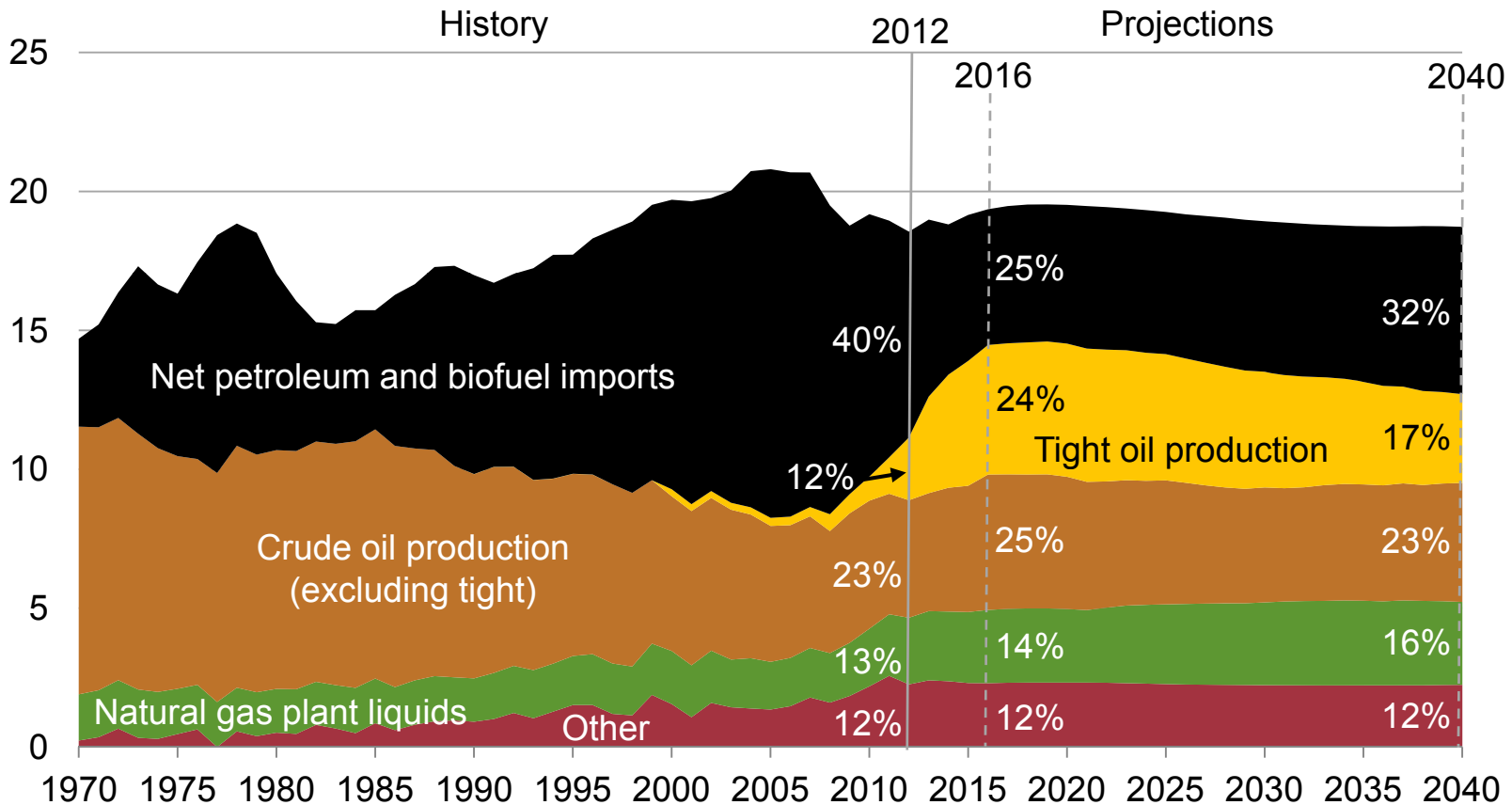
U.S. crude oil production  
million barrels of oil per day



Source: EIA, Short-Term Energy Outlook, May 2014

# U.S. import share of liquid fuels declines sharply because of increased production of tight oil and greater fuel efficiency

U.S. liquid fuels supply  
million barrels per day

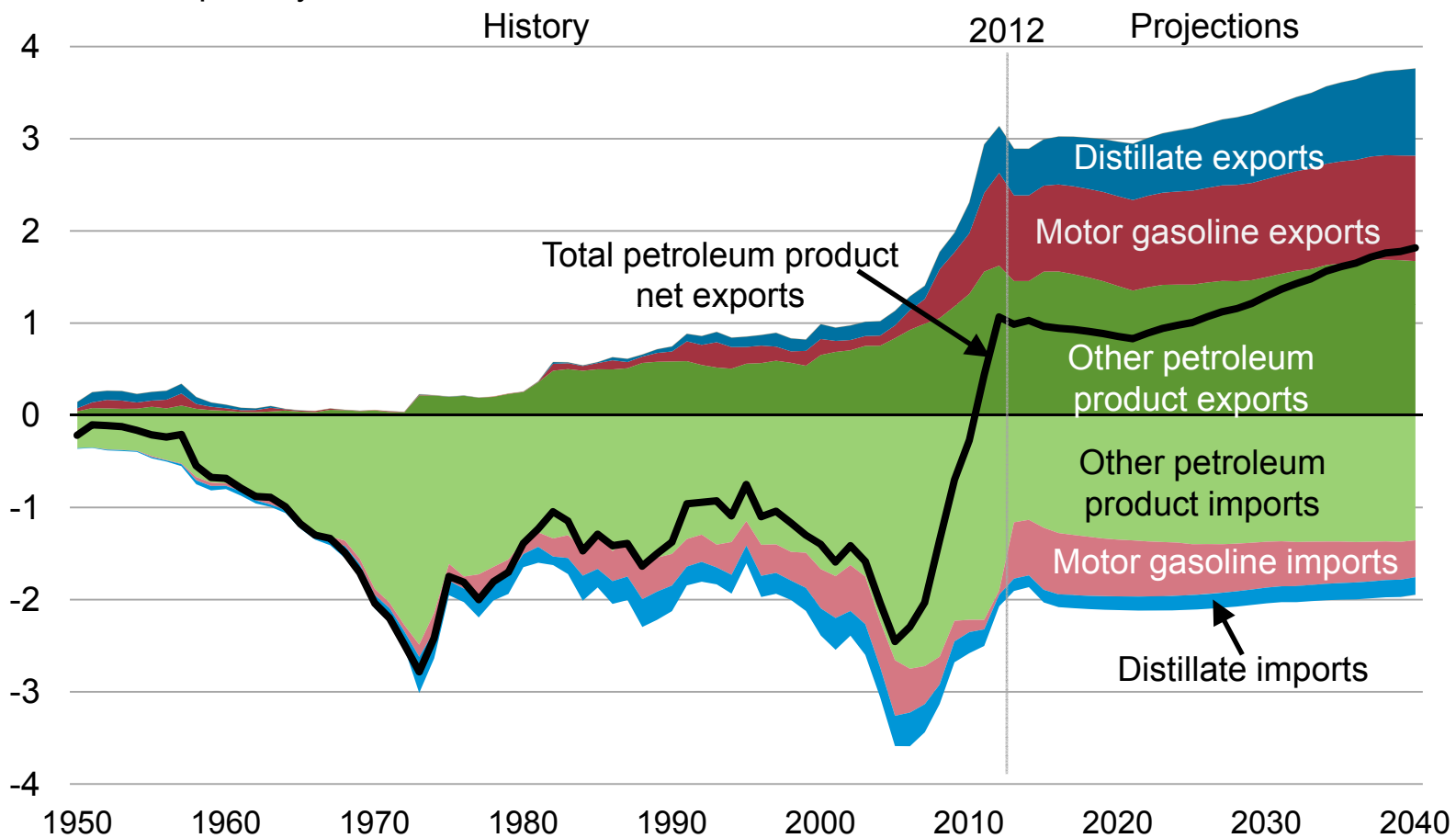


Note: "Other" includes refinery gain, biofuels production, all stock withdrawals, and other domestic sources of liquid fuels

Source: EIA, Annual Energy Outlook 2014 Early Release

## U.S. maintains status as a net exporter of petroleum products

U.S. petroleum product imports and exports  
million barrels per day



Source: EIA, Annual Energy Outlook 2014 Early Release